

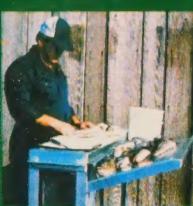


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Atlantic Fisheries Development

1983

1984

Annual Project Review

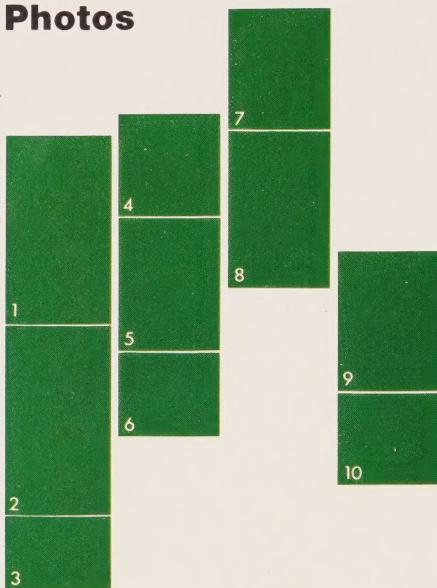
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Canada

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To a commercial fisherman the equation for increasing one's income used to be simple and straightforward — catch more fish, more quickly and you earn more money. The role of the Development Branch was also straightforward — develop the technology to assist fishermen in increasing their catch levels and thus, their incomes.

In the 1980s this simple equation of increased quantity = increased profits no longer works for most fishermen. Advances in technology and improvements in fishing techniques have led to excessive harvesting capacity for the limited fish stocks available and the emphasis on quantity led to a reputation for inconsistent quality.

The Task Force on Atlantic Fisheries stressed that a significant attitudinal change must take place in all sectors of the industry if the quality of our fish is to improve. Fish products have for too long been considered as commodities to be produced rather than perishable food to be eaten. Although almost everyone agrees that improved quality must be the cornerstone of the future economic viability of the industry, it cannot be imposed. Rather, as the Task Force said, the industry must be convinced that quality pays and that the benefits and costs of improved quality are shared fairly between fishermen and processors.

It is the mandate of the Development Branch of DFO to identify specific needs and initiate programs in product development and utilization of the Atlantic fishery resource including the transfer of new technology to the industry. The goal of these programs is to maximize the returns from the fishery while improving overall quality, reducing operating costs and increasing productivity. To achieve that goal the Regional Branches focussed on four major thrusts for the fiscal year 1983-84: Quality Improvement, Cost Reduction/Productivity Improvements, Resource Utilization and Development, and Product Development/New Products.

The Fish Inspection Service has recently initiated a Quality Improvement Program with emphasis on regulations and the establishment of product grading standards. In support of this initiative Regional Development Branches have conducted investigations and experiments designed to assist fishermen and processors to meet quality standards through the development, improvement and demonstration of gear and methods to maintain fish quality from harvesting to marketing. It has been demonstrated that fish which has been bled, gutted and boxed at sea will consistently result in a top grade landed product. Improved quality can result in not only higher value products, but also in reduced processing costs and waste. For processing plants, an increase in the production of higher value fillet packs as opposed to blocks combined with a small increase in yield and a decrease in trimming costs can mean substantially better financial returns.

The Task Force on Atlantic Fisheries estimated that *annual* losses in gross groundfish market revenues of between \$25 and \$50 million are attributable to quality problems (including losses at the processor level due to waste), sub-optimal product mixes, and lower prices than those received by competitors, because buyers hedge against inconsistent quality. This estimate is now considered to be too low.

The Task Force on Atlantic Fisheries identified cost reduction and productivity improvements as priority areas for development. The effect of high fuel prices on fishing and processing costs has been well-documented and could represent as much as one quarter of the landed price for some species. During the past few years a strong commitment has been made by the Department in Eastern Canada to help the industry become more energy efficient. Branch programs in this area have been aimed primarily at reducing fishing costs through vessel and gear improvements.

Although stocks of most traditional species are either fully exploited or nearly so, and the potential for further expansion is therefore limited, during the past year several exploratory surveys were undertaken to locate new fish stocks or fishing areas which might now be harvested using new techniques.

There are several areas open for developmental activities which involve maximizing the use of existing resources. Firstly, fish and shellfish can be farmed or reared under controlled conditions, oysters, mussels, salmon and trout being typical examples. Secondly, there are still underutilized and undeveloped species in Canadian waters that are not fully harvested by Canadians for various reasons. These include argentine, silver hake, dogfish, and various shellfish species. And thirdly, a number of traditional and non-traditional species may not be utilized for maximum economic returns. Even such traditional species as cod and pollock may have new uses as market conditions change (e.g. the manufacture of surimi for use in simulated high-price fish products).

All sectors of Canada's fishing industry must strive to improve products and productivity if the industry is to remain competitive. Advances in processing technology and equipment successfully used by fishing industries in other areas will continue to be adapted to our own conditions to determine their suitability. More importantly, however, efforts will be increased to develop innovative Canadian techniques and procedures to be used by our industry. These new techniques will be continuously evaluated and modified to obtain maximum benefits for fishermen, plant workers, processors and consumers.

Newfoundland

REGION

Contoured containers
for small open
inshore vessels

Open Boat Containerization

Nine open inshore boats (5m – 10m, 18'-32') were each provided with four 9 cu.ft. insulated X-Actics fish containers for use on board. These units served as an alternative to anti-bacteria paints and bulkhead insulation. The containers also provided sanitary storage for the catch, convenient ice carrying capability, easy maintenance, and a means for segregating, bleeding and washing the fish on board. Other important advantages realized by container users included easy discharge and fish quality maintenance. Fishermen were able to spend longer hours on the fishing ground without suffering any significant down-grading in fish quality.

Work continued on the development of a trap boat containerization system with effort focusing on final container design and fabrication methods. The developer now has rotational molding capability, which should produce foam polyethylene contoured containers for use during the 1984 trap fishery.



On Board Handling — Fish Storage for Inshore Gillnetters/Longliners

The on board handling system for inshore gillnet vessels developed in 1982 was commercially tested during the 1983 season. A complete system, which includes fish ramp, wash/bleeding tank, drainage system and fish boxes, was installed on board a 17m (58') Bonavista-based gillnetter for the 1983 fishery.

One other vessel operating in the same area continued to use a prototype system produced in 1982. An analysis of catch results showed that the two equipped vessels landed approximately 62 per cent Grade "A" cod, 80 per cent Grade "A" turbot and 88 per cent Grade "A" flounder. Six similar vessels surveyed showed Grade "A" landings of 44%, 66% and 76% respectively, for these species over the same period. All eight vessels landed fish in conjunction with a dockside grading program which was being conducted by DFO at Bonavista.

In 1983, additional work was undertaken to determine the feasibility of using insulated fish containers in

A 16.5m (55') inshore gillnet vessel was equipped with fourteen containers (approximately 13,500 kg or 30,000 lb. storage capacity) eleven of which were positioned in the fish hold with the remaining three carried on deck. The on-deck units were used to carry ice, and fish when catches warranted. After one season's operation, the skipper and crew were quite satisfied with this containerized approach to fish storage and handling. With off-loading speed of 13,500 kg/hour and the positive impacts of container use on fish quality, this system should give fishermen many advantages when quality improvement regulations are put into place.



the holds of larger inshore fishing vessels. These 1m³ (35 cu.ft.) capacity containers are identical to those used by much of the Newfoundland fishing industry today. They would provide fishermen with the option of containerizing larger volumes of fish on board, thus ensuring a quality fish storage area and a fast and quality-oriented method of off-loading.

Compact handling system for inshore vessels

Quality Improvements — Offshore Trawlers

Present fish storage and handling practices on board offshore wet fish trawlers have been identified as one area where major gains in landed fish quality can be achieved. This year the Development and Analysis Division participated with industry in three projects directed at improving storage and handling methods on board.

A section of the fish hold of the Fishery Products International vessel M/V ATLANTIC BEATRICE was equipped with a prototype fish pen breakdown system. This system allows iced fish to be mechanically discharged from the bottom of each pen. As fish are removed from the bottom tier, new fish from tiers located above slide down into position for removal. The procedure eliminates the negative quality impact of discharge crews using shovels and other utensils to move fish from each pen into the discharge area.

The Newfoundland and the Scotia-Fundy Regions of the Department cost-shared with National Sea Products, a project to equip the M/V CAPE SMOKEY with 180-200 collapsible fibreglass containers. These will occupy one quarter of the vessel's present hold capacity. Each container can store approximately 250 kg. (550 lbs.) of iced fish. Project schedules were delayed due to problems with container manufacture and delivery and it now appears that full implementation will not commence until the summer of 1984.

*Offshore groundfish
trawler the M.V.
CAPE SMOKEY*

During 1983 the Newfoundland Branch provided financial assistance for design of the contrawl trawler containerization system which has been developed by the BAE Group of St. John's. It uses a computer to direct, position and move insulated containers on board the fishing vessel. Fishery Products International has agreed to make available the M/V ATLANTIC MARGARET or similar vessel for installation and testing of the system during autumn of 1984.



Cost Reduction

Ener Sea Program

A computer-equipped vehicle, complete with software developed by Seimac Ltd., a consulting firm, has been put into service by the Development and Analysis Division. The computer analyzes individual vessel parameters such as horsepower, reduction gear, shaft and propeller characteristics and hull dimensions. It then evaluates the vessel's performance and recommends modifications that could be made to the vessel to improve its energy efficiency. In addition, the model presents the costs of making these changes and the long-term benefits which will be derived from them.

During 1983, a series of tests and trials were conducted on several inshore vessels to validate the procedure and to increase the data base. Some of the modifications recommended by the computer were implemented on the test vessels, resulting in fuel efficiency improvements ranging from five to thirty percent.

The program was made available to fishermen in several areas throughout the Region and was favourably received by vessel operators. Further expansion and validation of the program is being undertaken and a wider scale introduction to the industry is planned for 1984.



Fuel monitoring meter

Vessel Instrumentation

During 1982 and 1983, four inshore vessels were equipped with fuel monitoring systems. This equipment allowed operators to accurately measure the amount of fuel consumption at any given engine operating speed. Data collected from trials conducted on all four vessels provided a base from which general recommendations were made to vessel operators.

The test vessels were equipped with four different engine types and were prosecuting four different fisheries. This diversity enabled project personnel to document actual engine operation requirements on a day to day basis and to project seasonal energy consumption profiles. From these, recommendations will be made which can be adapted to particular fleet operations.

The Ener Sea computer equipped van

Cost Effective Vessel Design/Construction

Many Newfoundland inshore fishing operations have suffered serious financial setbacks over the past few years. Many fishermen purchased large inshore vessels at a time when costs were low, licenses readily available and the industry in general appeared to be on an up-swing. Changes in the industry and fisheries management have left many individuals with vessels having relatively high operating and maintenance costs, while dependent solely on groundfish for their livelihood. Fishing for groundfish with nets and longlines could be prosecuted from smaller and more cheaply operated vessels if they were designed specifically for these operations.

A proposal from the Newfoundland College of Fisheries, Navigation, Marine Engineering and Electronics to construct two inshore fishing vessels was accepted by the Department of Fisheries and Oceans and cost-shared with the Canada Employment and Immigration Commission. Special design factors of the two 13.5m (45') vessels include cost-efficient propulsion systems and hull configurations, and other specific features aimed at the landing of top quality fish.

One of the vessels is being constructed from wood, the other from aluminum. Construction is tentatively scheduled to be completed by the summer of 1984. At that time, both vessels will be introduced to the inshore fishery for evaluation. Criteria are now being established for selection of operators who will lease the vessels for commercial fishing operations.

Freezing-Processing Groundfish

A project conducted in 1982 whereby excess trap cod was frozen over the summer months and processed in late fall and early winter, when raw material was unavailable, was undertaken to determine the practicability and feasibility of this procedure. It was believed that if such work could be undertaken successfully then fishermen, plant workers and processors would benefit from a longer operating season. The results of this project showed that trap fish could be frozen and then processed later in the year. Product yields averaging 30 per cent, and final pack-outs comparable to those frequently realized during the trap fishery, indicate that this type of operation may have merit. However, because of the generally small average size and high moisture content of trap cod, it may be that other groundfish would be better suited to freezing and later processing. In addition, quality losses in trap cod incurred during cold storage, defrost operations, and greater than normal handling and freezing costs, tend to unduly inflate the cost of such products.



A second phase of this project involved the salting and drying of frozen trap cod. The results of this experiment indicated that high quality saltfish could be produced from frozen trap cod. Product yields amounted to 35.7 per cent with grades of 4.25%, choice; 49.85% Amarbon; and 34.12% Amaruno, with the remaining fish receiving a lower grade classification.

In 1983, approximately 72,000 kg (160,000 lbs.) of inshore cod primarily trap and gillnet fish were frozen during the summer for processing in November. This fish was randomly selected from fish being landed at Beothic Fisheries in Valleyfield. An additional 18,000 kg (40,000 lbs.) of Grade "A" cod were frozen by the Fogo Island Co-Operative Society to be used as a control group for later comparisons of final quality and pack-out.

The experiment showed that there is a significant decrease in the quality of defrosted fish when compared to the quality of fish placed in cold storage. Of the several defrost procedures which were used, defrosting by circulating sea water was found to be the better method. Product yields ranged from 25.61 to 31.48 per cent excluding minced production. However, final pack-out form in terms of prime packs (5's and 10's) was significantly lower than anticipated, with only 8.3 per cent of final production going into prime packs.

Production comparisons made between the Grade "A" and standard grade material showed increased yields, lower costs and less quality deterioration in the control fish group.

Longline caught cod
off eastern
Newfoundland

Resource Utilization and Development

Demonstration and Evaluation of Inshore Longline Systems

Once the predominant fishing technique of Newfoundland fishermen, longlining has since declined in use throughout much of the Region. With today's emphasis on quality, and with increasing operating costs reducing the viability of other fishing methods, many Newfoundland fishermen are reconsidering longline fishing. As part of our ongoing programs to identify viable improvements compatible with Newfoundland conditions, the Development and Analysis Division implemented several longline projects during 1983.

An assessment of the automated Mustad autoline system on a 17m Newfoundland inshore vessel over the past four fishing seasons has shown that this method of longlining has sound potential for local longline operations. However, the high cost of the system combined with other economic factors particular to the area, makes the operation less than ideal.

*The autoliner the
M.V.
GARRY-MICHEAL*



A Sari longline system, which has capabilities similar to the Mustad system, was purchased by the Development and Analysis Division and installed on board a 16.5 m inshore vessel operating on the Northeast coast. Preliminary fishing trials conducted in August and September 1983 in the Musgrave Harbour area indicated that this system needed major improvements in baiting operations before it could be used with any degree of success. The Norwegian developer of the system made these improvements over the winter months and has conducted small scale demonstrations on board the vessel. Baiting efficiencies and retrieval speeds now indicate that this significantly lower priced system can be used successfully in the area.

The gangbaiting system, which has been under development for the past four years, has now reached a stage where it can be commercially tested. Developed jointly by Nordco Limited and the Department of Fisheries and Oceans, this relatively low-priced longline system received limited testing in 1983. Commercial tests showed that inexperienced longline fishermen who used the system could in fact fish a sufficient number of hooks on any given fishing day to make line fishing viable.

Testing of the equipment during the winter fishery on the south coast of the Province indicated that improvements to the system were necessary, especially when operating in below freezing temperatures. These improvements have now been made to the system. With baiting efficiencies averaging 95 per cent with squid, 80-90 per cent with mackerel, and the good baiting and handling speeds obtained by system users, the gang-baiting approach to line fishing could offer Newfoundland fishermen an attractive alternative to present methods.



The contracted Norwegian autoliner, the M.V. KELTIC



A Mustad Miniline system was leased from the manufacturer and commercially tested in August and September of 1983. This semi-automated system utilizes all monofilament lines. Monofilament has proven to be almost twice as effective as conventional lines in shallow water (less than 150m), even though its ability to be fished on rough bottom is limited.

The time and labour required to fish an acceptable number of hooks is a major deterrent to operators using the miniline system. In addition, longlining with monofilament lines requires the development of a special expertise before inexperienced crews become proficient enough to make such operations viable.

Middle Distance Longlining

To determine the technical and economic viability of a year round longline fishery in middle distance waters, a Scandinavian longline vessel was contracted to conduct commercial fishing operations in NAFO areas 2 + 3KL for a full year. The services of the Canadian Saltfish Corporation were engaged to administer the contract, fully documenting expenses, fishing effort, catches and areas fished.

The M/V KELTIC is a 35m (118') L.O.A., 725 horsepower, 280 ton autoliner equipped with 35,000 hooks. Permitted to operate outside the 12 mile limit in any area of 2 + 3KL, the vessel was paid on a catch basis only. From April 28, 1983 to February 29, 1984 she completed 12 fishing trips (210 fishing days) and landed approximately 1,260,000 kg (2,800,000 lbs.) of cod (head on/gutted).

These results are very encouraging, considering that ice conditions hampered operations on several occasions. In addition, the vessel was forced to spend much time searching for fish as it was the only longline vessel operating in the area.

This project concluded in April 1984. An assessment of viability and a report are underway and should be ready for public distribution by the end of August, 1984.

The Mustad Miniline system

Resource Utilization and Development

Inshore groundfish dragger

South Coast and North Coast Newfoundland Crab Survey

On the south coast of the Province the area surveyed included the outer limits of Hermitage Bay, Fortune Bay and Placentia Bay and the offshore area between the eastern Avalon Peninsula and the Burin Peninsula, extending from nearshore waters out to 100 nautical miles and covering approximately 13,000 km² (5,000 sq.mi.). Fishing depths ranged from 100 to 300 meters.

Crab catches taken in the area were generally poor, with the exception of a small area located near the east and southeast corner of the Avalon where catches per pot ranged from 7 to 11 kg (15.5–24.5 lb.)

In northern waters, survey operations extended from the Grey Islands to William's Harbour, Labrador, covering approximately 9,600 km² (3,700 sq. mi.). Good catches were realized in the Belle Isle area, amounting to 33 kg (73 lb.) per pot.

The majority of crab taken during the survey had new shells, indicating that the stock had just concluded moulting. This would reflect negatively on catches, as the moulting and post-moulting periods are generally accepted to be poor for commercial crab fishing. Improved catches might have been taken either earlier or later in the season.



Exploratory crab survey vessel



Groundfish Bottom Trawling Survey — Labrador Coast

The inshore cod quota in NAFO areas 2JH has not been fully exploited in past years. The Development and Analysis Division initiated this project in conjunction with the Development Division of the Gulf Region to determine the potential of a towed gear fishery in selected areas along the Labrador Coast. If successful, this venture could encourage other fishermen to take advantage of these stocks, thereby lengthening their fishing season and increasing their earning potential.

Two inshore trawlers were chartered to conduct towed gear fishing trials in the area from Batteau to Hopedale. Catches taken by both vessels were very low, a fact attributed to bottom topography and to dirty water encountered throughout the project. No new areas suitable for towed gear fishing were located.

Shrimp Pot Fishing — Trinity Bay

Efforts to identify and assess shrimp stocks in areas such as St. Mary's Bay, Placentia Bay and Trinity Bay in the 1970's indicated shrimp resources with limited commercial potential. Logistical problems indicated that harvesting methods other than towed gear fishing would be needed to harvest shrimp in these areas.

Shrimp pot fishing has been used successfully in other parts of the world and could possibly be used to establish a commercial shrimp fishery in Newfoundland waters. In 1983 the Development and Analysis Division conducted a small-scale pot fishing experiment in Trinity Bay to determine the potential of this fishing method.

Two types of pots were used in the project and various combinations of bait types were tested. Catch results were low, averaging 0.11 kg (0.24 lb.) per pot. Shrimp taken from the pots were generally very small, with an average count of 225 shrimp/kg.



Mobile blast freezer

Mobile Blast Freezer

Many fishing communities in the Newfoundland Region are unable to take full advantage of seasonal fisheries. Processing capacity has been designed around average landings rather than unpredictable peaks. Consequently, when fisheries such as the squid, mackerel, herring and cod trap fisheries peak, industry is often at a loss to accommodate all the fish harvested by fishermen.

In 1983 the Development and Analysis Division purchased a mobile blast freezer which could be used to provide increased freezing capacity in areas experiencing exceptionally high landings. With the failure of the squid fishery and only an average cod trap fishery in many areas, the freezer received limited service; however, it was used on the Northern Peninsula to freeze mackerel harvested by local fishermen. The operation showed that the unit's mobility and freezing capacity (approximately 19,000 kg/18 hours) could offer important advantages to the Newfoundland fishery.

Further testing of the freezer unit will be carried out and it is hoped that this type of equipment will provide the flexibility required to enable the processing sector to handle more fish during periods of peak landings, thereby reducing the necessity to restrict landings.

Mechanical Salting System

The preparation of salted cod fish is a labour intensive process which is subject to much variation. Although, salting procedures and schedules have been provided to the industry and are followed closely by salt fish producers, salting cod fish is a manual task and is, therefore, reflective of individual efforts. Consequently, uniformity and consistency in salting operations are difficult to obtain. Moreover, manual salting practices frequently use more salt than necessary. This excess salt cannot be recycled, contributing to inefficiency in salt fish production.

A mechanical salting system was provided to the Fogo Island Co-op by the Development and Analysis Division in the fall of 1983. The system mechanically transports and evenly applies predetermined amounts of salt to split fish, and re-cycles unused salt. It provides consistent salting throughout and is easily programmed to meet any salting specification ratios desired by operators.

Following installation, the equipment was demonstrated to operating personnel, but because the fishing season was closed by the time of installation, no fish was put through the system. All the equipment is now in readiness for the 1984 season.

Salt Fish Drying Trays and Racking

The Newfoundland salt fish industry utilizes a variety of fish drying tray and racking materials. Both wood and steel are used extensively because of their availability and low cost. There is, however, a need for a better tray and racking material because of the rapid corrosion of steel, and the high maintenance costs of wood and the poor effects of wood on fish quality.

The Canadian Saltfish Corporation, with assistance from the Development and Analysis Division, undertook an investigation and testing of fibreglass drying trays and racking. In-plant testing indicated that fibreglass is well suited to both tray and racking applications. However, high capital costs and the need for an improved tray design will limit the application of the material to the saltfish industry.

Gulf
REGION

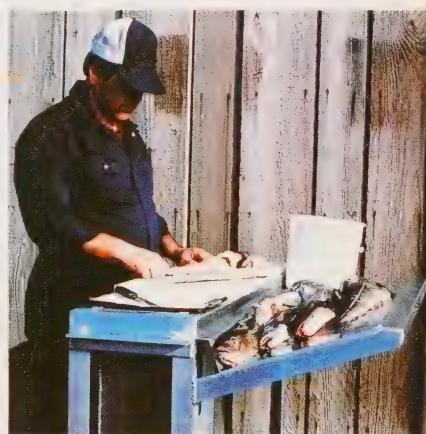
Dockside Grading

Dockside grading program

The development of a dockside grading program involving a fleet of midshore groundfish vessels in eastern New Brunswick led to more grade "A" fish at dockside. Fishermen were paid a premium of five cents per pound for grade "A" cod and flounder, and by the end of the project 671,390 pounds of cod, or 56 per cent of the total catch, had been graded "A". Flounder was not graded because fishermen did not bleed the fish. The program seemed to calm some of the initial concerns of fishermen regarding the benefits of putting extra effort into the handling of their catches. The dockside grading project was carried out at Connors Brothers Fish plant in Shippagan, N.B.

In the Nova Scotia Gulf Shore area, a dockside grading program was set up for herring landed in insulated containers. Fishermen on the eight participating vessels were paid an incentive of five cents per pound (three cents from DFO and two cents from the processor) for landed grade "A" product. The project was so successful that the quality of the fish satisfied the buyer for the demanding Japanese market while other areas had difficulty selling herring. Some refrigeration problems at sea, however, were identified.

A similar dockside grading project for groundfish was administered by DFO and the United Maritime Fishermen at Port Hood. Two of the vessels which participated were Danish seiners, while thirteen were gillnetters and longliners. More than 97 per cent of the total cod catch and 86 per cent of the hake were graded "A" using proposed departmental standards. Although the fishermen were pleased with the results of the project, it was noted that refrigeration at sea can still improve. Most fishermen were of the opinion that temperature requirements could not be met on inshore vessels because of the lack of proper equipment and time out at sea.



Carbon Dioxide Build-Up — Snow Crab Mortality

In studying the extent of carbon dioxide build-up in fishing vessel holds, DFO scientists in Northeast New Brunswick found CO₂ levels can reach as high as 15 times that of normal atmospheric conditions. It was also found that poor on board handling of snow crab led to a crab mortality rate ranging from 4 to 40 per cent. The final report recommended that further efforts be made to improve crab handling at all levels before further studies of CO₂ build-up are made.

New Unloading System for Inshore Boats

A new unloading system for transporting boxed fish from inshore boats is now operating in Val Comeau. It consists of an electric elevating platform which speeds unloading, reduces manpower and is safer than other systems. It can be used to load ice, bait and gear into fishing boats. DFO will install four of these relatively inexpensive systems on inshore wharves in the near future.



Bucket unloading system

Other Developments

DFO also developed and installed prototype fibreglass insulated fish liners on two fishing vessels in the Cheticamp and Pictou areas. The prototypes performed well, with some modifications remaining to be made on the Cheticamp vessel.

In the eastern New Brunswick area, a prototype drifting trap net for mackerel performed well in initial testing, as did an efficient bucket unloading system adapted to inshore fisheries, a fibreglass liner for cement curing tanks, a fish cutting and washing table for vessels in the 40 to 45 foot range and a prototype Refrigerated Sea Water and Circulating Sea Water system for holding snow crab.



Fish unloading platform for inshore vessels

Cost Reduction and Productivity Improvement

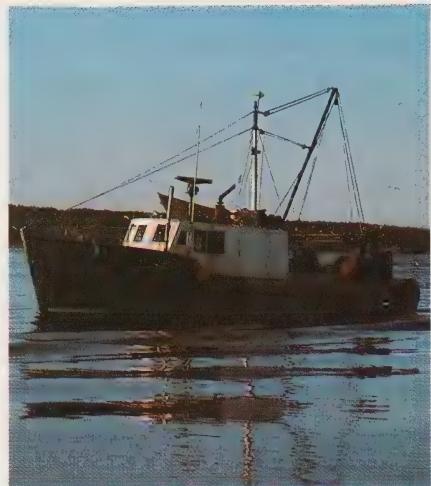
Shrimp trawler

Shrimp Processing On-Board

In eastern New Brunswick, a project begun in 1981 to improve the value and quality of landed shrimps through on-board freezing was completed last year. In 1981, a 75 foot shrimp vessel was equipped with a blast freezer and the fish hold was modified. Additions in 1982 included a sheltered deck, a packing table and shelving. The operation consists of grading the shrimp, weighing and packing the larger ones in specially designed five kilogram boxes and then freezing. Approximately 340 lbs. can be processed per hour.

During the first two days of the operation, the Captain of the vessel froze his entire catch, boxing larger shrimps and putting the smaller catch in bags. In the last nine days, he froze only the large shrimp, storing the small shrimp in bulk on ice. Prices offered for the shrimp rose to \$1.40 and \$1.50 per pound, from the 60 cents per pound offered for unprocessed shrimp. The Captain was able to extend his trip by two days because of the processing system.

Pandalus Borealis — shrimp



Shrimp Sorting Trawl

DFO sought to reduce the immature redfish and groundfish by-catch problem encountered in the shrimp fishery north of the 50th parallel. A three-inch sorting panel was installed in two high lift Terra Nova Shrimp Trawls, one a 1000 mesh and the other a 1168 mesh. A second end installed over the first was used to determine the amount of groundfish and shrimp separated by the panel into each cod end. Shrimp losses of 20 per cent were suffered through the 1000 mesh top cod end and 26.8% through the 1000 mesh trawl. Both trawls experienced a 100 per cent separation of groundfish and a 50 per cent separation of immature redfish in the second cod end. Continued modifications of both sorting panels will be necessary before this technology is acceptable to fishermen.

Scallop Drag Comparison

Six spring-loaded Scottish Scallop Drags were introduced to the Port au Port Bay scallop fishery in an experiment to demonstrate this more efficient method in comparison to conventional drags. Catch rate increases of between 60 and 100 per cent were experienced over similar vessels using standard equipment. The Scottish drags allowed fishing to be conducted in areas with hard, rocky bottoms that were previously ignored. These drags will be demonstrated in the Icelandic scallop fishery, on the northwest coast and elsewhere in the Gulf in 1984.

Rope Coiling System

A prototype rope coiler for use in the snow crab fishery was developed and proved successful in early testing. New Brunswick fishermen have shown an interest in the system, but further testing will be done in 1984 before it is fully recommended.



Self-hauling rope reel system on the M.V. Monique H.

Self-Hauling Rope Reels

A new, more efficient hauling system for Scottish seining passed final tests in 1983 and is now being produced commercially at Caraquet, New Brunswick at a price below that of the conventional machinery which it replaces. In 1982, the prototype system, 2 fully-powered rope reels developed by DFO were installed on board an 85 foot wooden groundfish vessel. Extensive testing showed that the equipment eliminates the need for costly hauling, reduces fuel consumption and greatly lessens wear on the expensive rope used in Scottish seining. The simplified deck arrangement also makes fishing safer.

Longline Demonstration

The effectiveness of the Brownell groundline and the Sea Horse bait cleaner was compared with the gear used by longline fishermen in eastern New Brunswick. The Brownell line no. 24 was judged superior to the polyheaded line used by most fishermen in the area. It was more resistant to twisting and was easier to bait. The Sea Horse bait cleaner also proved to be an improvement over most units now used. It had tighter brushes, resulting in improved hook cleaning and less hook damage.

Longline demonstration, Caraquet, N.B.

Rock Crab Shucker

A prototype mechanical shucker for rock crab was installed at the Bluenose Fish Plant in Richibucto Cape during the 1983 lobster season. Results with both crab and lobster were encouraging and some modifications will be made before further testing in 1984.

Lobster Bait-Bag Project

Tests of a newly-developed bait-bag for lobster fishing showed the bags were not strong enough, with almost all being ripped open by lobsters and crabs. The catch rate for 50 traps set with the new bait bag and 50 baited traditionally was the same. Efforts are being made to strengthen the bag material.





Prototype Cod Traps

In an effort to find an alternative to gill-net fishing, 45 prototype cod traps were built and used. On the Gulf side, technical problems were encountered and the gear will be further tested in 1984. In the Bay of Chaleur, however, the modified traps were tested and the results were encouraging. Further tests will be carried out during the coming season.

Vessel Instrumentation Project

A fuel warmer device was tested last year by the Western Newfoundland Area in conjunction with the Newfoundland Region. A 65 foot dragger with a 365 BHP Caterpillar diesel engine had a fuel warmer and fuel flow meter installed. It was found that by reducing the RPM from 1810 to 1600, there was a 34 per cent fuel saving and 0.7 knot speed reduction. For a 100 mile trip, this would mean a saving of about \$58.00 (at current fuel prices) for an extra 44 minutes steaming time.

Prototype cod trap

Resource Utilization & Development

Crab Survey

A survey of the crab resource was conducted in Western Newfoundland along the northwest coast, from Bay of Islands to Ferolle Point. The survey consisted of 8 fleets of 20 crab pots with 4 fleets hauled and re-set each day and was carried out in waters up to 80 fathoms deep and 25 miles from shore. For 21 sets in the Pointe Riche to Ferolle Point area, a small localized resource was found. The deep channels of Bonne Bay and the Bay of Islands have small localized populations of mature crab. Twenty-six sites in the Pointe Riche to Bonne Bay area recorded no snow crab population.

Crab survey along northeast coast of Newfoundland



Flounder Survey

Another study found suitable flounder grounds of a small localized nature in the Bonne Bay and Bay of Islands areas. Small quantities of jellied flounder were also encountered, but 60 per cent of the total catch had to be discarded, being less than 12" in length. The survey indicates a lack of flounder grounds suitable for dragging and suggests that new fishing efforts for groundfish species in that area would not be productive.

Other Developments

To speed the return of salmon to the Nepisiguit River system, DFO has been tagging salmon and grilse, stocking fingerlings, electro-seining as well as placing a trapping fence on the river. The project has been ongoing for three years and there now appears to be a small grilse run in the river.

Tests were conducted to determine if there could be directed squid fishery in the Bay of Chaleur area. Results indicated that the availability of squid is limited in the Bay of Chaleur, Miscou, Gaspe, Port Daniel and Bonaventure Island areas.

Scotia Fundy
REGION

Gillnet Herring Quality

During the past year, DFO tried to raise the quality of gillnet herring by improving net hauling and handling procedures on vessels fishing off southwestern Nova Scotia. The quality of some gillnet herring was thought to be inferior due to crushing in the gillnet hauler, damage when removed from the net, quality deterioration due to lack of icing and poor unloading practices. Representative vessels were equipped with a stern-fitted spindle roller to spread open the gillnets. The roller was designed with sloping sides, which made contact with the net only at the ends, reducing crushing to a minimum. The new roller operated smoothly and resulted in less manpower, thereby allowing crew members to improve fish handling and holding practices.

One thousand pound insulated containers, supplied by DFO and the Nova Scotia Department of Fisheries, were placed on each vessel directly under the nets being hauled. An automated aluminum net shaker, driven by each vessel's hydraulic system, was installed onboard the

gillnetters to reduce quality losses due to manual net shaking. Meanwhile, unloading was simplified by hoisting the container to the wharf where the herring were washed and transferred to insulated wharf boxes. Both fishermen and processors were pleased with the project and generally agreed that herring quality was consistently higher on the project vessels.

Evaluation and Improvement of Scientific Quality Procedures

DFO personnel from the Development and Inspection Branches have been working with non-government contractors to develop a grading "kit" to improve the overall effectiveness and accuracy of the dockside and in-plant grading of fish. To date, standardized grading procedures have been developed for groundfish and flatfish, and standards for determining the extent of discolouration in fish flesh are now ready for use. As well, procedures for laboratory quality assessment have been prepared. Work continues in this important area, specifically in developing odour standards and in the application of instrument aids in grading.

Dockside grading program



Onboard Rotary Washer

A rotary washer designed by DFO engineers and installed on an offshore trawler in 1982/83 performed very well during tests in the fall of 1983. The rotary washer consistently washed fish better than the batch tank washer, where washing times are highly irregular. Not only was there a significant reduction in slime in the rotary-washed fish, but the new washer did not damage the fish.

Dockside Grading

Can the dockside grading procedures used in several inshore projects in eastern Canada be applied effectively at large offshore facilities? To find out, a project was set up to run for one year and involved sampling large numbers of fish from 10 trawler trips. The results showed conclusively that dockside grading using the four level DFO grading system is feasible, with some modifications, for offshore trawlers. Grading did not raise costs, and in fact, experience shows that there is an economic advantage to grading at dockside.

DFO end of line grades were successfully used in the processing operation, although they did not correlate with the dockside grades because some factors, such as parasite infestation, were not considered when grading at dockside. The project clearly showed the superiority, in terms of



Dockside grading program

quality, of fish boxed at sea over fish retained in, and unloaded from, open pens. It was also shown that boxing at sea in this particular case was economically justified. Towing time and the delay between fish coming out of the water and being stowed in the hold played a major role in the quality of the landed product.

Cost Reduction & Productivity Improvement

Fully-Powered Rope Reels

Following the successful development of fully-powered rope reels, DFO staff in the Development Branch sought to scale down the reels in terms of power output and physical size, thereby reducing production costs and making the reels useful for all vessels in the 15 to 20 metre (49'-65') range. The project vessel fishing out of eastern Nova Scotia operated successfully with the prototype reels, and the skipper/owner reported a significant reduction in man-hours required in the actual fishing operation. Crew members thus had more time to process and stow the fish, and the reduction of friction in the hauling process greatly increased the useful life of the expensive rope used in Scottish seining. As well, more areas could be fished due to the power of the reels and more rope could be used more efficiently at a lower cost per pound of landed fish.

Canadian innovation in self-hauling rope reels

Automated Longlining

In addition to continuing work in evaluating innovative aspects of automated longlining, the Development Branch contributed to the efforts of the Longline Working Group, which had as its objective to co-ordinate activities of the four DFO Regional Development Branches on the east coast. The Group commissioned the preparation of an audio-visual presentation and a catalogue of the various longline systems available.





Sail-Assisted Fishing Vessels

The Branch has undertaken an analysis of the feasibility and potential benefits of retrofitting sails on fishing vessels. The first part of the study, computerization of wind data, is already operational on the Development Branch's computer in Halifax. The second part of the study, now underway, will enable any track in the Scotia-Fundy Region to be assessed for wind direction and strengths as well as computing the reduction in fuel based upon a particular vessel. The project will also assess and demonstrate the benefits of sail-assisted fishing by installing a sail on a longliner.

Snap-On Drum Longlining for Halibut

The west coast fishing method of snap-on drum longlining was introduced to halibut fishermen in Atlantic Canada. This system takes less deck area than the conventional tub system, thereby providing more work space and safer conditions for the crew. The gear can also be more easily baited to suit bottom conditions. The labour saved enables the crew to handle fish more quickly and carefully.

The system was installed on a 19 metre (62') vessel from southwestern Nova Scotia which had been fishing for halibut with conventional longlines. The skipper and crew were very impressed by the versatility of the gear for varied bottom conditions and the labour reduction on board. Other fishermen have already ordered similar gear and local suppliers are becoming involved.



Snap-on drum longlining for halibut

Kort nozzle may reduce fuel consumption by scallop draggers

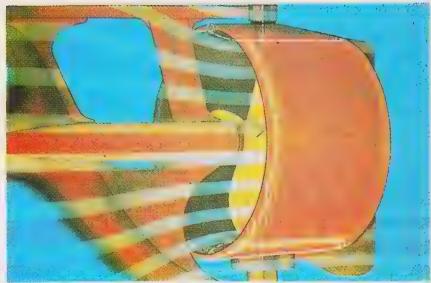
Fuel Heaters

A series of tests were completed last year on fuel heaters at temperatures varying from 80°F to 180°F and the results showed that although fuel consumption at full load was reduced by about 6% at the higher temperatures, output horsepower decreased by 10%.

Further testing was carried out this year under conditions which more closely reflected actual operations on-board fishing vessels. The results showed that at partial loads specific fuel consumption increased and varying the RPM's of the engine did not alter these results.

A series of tests were also performed on a diesel engine to determine whether synthetic lubricants significantly altered energy usage. Only a small reduction of 1-2% was observed.

Throttling back — still the best way to save fuel



Energy Consumption & Vessel Analysis

The Eastern Fishermen's Federation was contracted to obtain energy consumption information on inshore vessels. EFF installed meters on eight boats, and observers, hired under a federal job creation program, monitored the fuel consumption. It was found that the fuel meters had a positive impact on the attitude of the fishermen, and that the average fuel consumption was reduced by 18 percent at the end of the trial period.

Work continued on demonstrating and gathering data on energy consumption resulting from vessel modifications. Two offshore scallop vessels which are heavy users of fuel were instrumented. One vessel had a nozzle installed and the fuel consumption and landings were monitored. Because of recent changes to regulations and fishing grounds, a direct comparison of fuel usage was invalid without considering the change in landings throughout the fleet. Comparison with unmodified vessels showed that the nozzle was responsible for increased earnings through reduced fuel consumption.

Resource Utilization & Development

Square Mesh Codend Trials

Preliminary trials in 1982/83 showed that square, instead of diamond shaped meshes in the codend reduced the catch of undersized fish and debris with no reduction in the catch of marketable fish. These important trials were continued in 1983/84 with a different trawl material (nylon) of larger diameter, but with the same vessels and in the same general areas. The trials showed that substantial benefits can be achieved with this trawl. Using a 130mm mesh size codend, the number of small fish, especially cod and haddock, was reduced from about



13 per cent to 2 per cent. In addition to the usual debris, such as seaweeds, sand, shells and gravel, unwanted species such as sea cucumbers and sea urchins generally pass through the square mesh trawl. The clean catch of



Square mesh net

Square mesh codend

large fish results in a large reduction in the amount of work on deck. The fish can be processed and stowed more quickly resulting in improved quality. Trials with larger trawls on offshore vessels will be carried out in 1984.

Scallop Survey

An exploratory survey of the Icelandic scallop beds on the Grand Banks concluded that commercial exploitation of these beds is not economically feasible. The scallops were small and very difficult to shuck, and the meats were of poor quality.

Shrimp Fishing

There are substantial reserves of shrimp off eastern Nova Scotia which are fished only occasionally by trawlers from northeastern New Brunswick, and the Scotia-Fundy Development Branch last year sought to create interest among fishermen and processors to take advantage of this resource. A 65 foot vessel was chartered and had promising catches, although marketing was a problem initially. Two 45 foot trawlers were rigged for pair trawling for shrimp, and are to be fished in the spring of 1984. It is hoped that this will show that smaller, low-powered vessels can also participate in this fishery and thus extend the fishing season for inshore vessels.

Tuna Longlining

The Development Branch received permission from the Japanese Fishing Association to send a gear technologist as an observer on a tuna longliner. He subsequently spent 21 days on board a 157 foot longliner in the fall of 1983, providing a detailed description of fishing gear, how and when it is set and hauled, and how the fish are handled. A slide presentation at a marketing meeting in Quebec City in February, 1984, was very well received. Although there are no Canadian vessels able to freeze and store tuna at the required temperatures, there appears to be considerable interest in this fishery in Canada.

Quebec
REGION

Groundfish Storage for Offshore Vessels

In studying an array of storage methods for groundfish in the holds of offshore fishing vessels, scientists found that the substantial savings that come about by using refrigeration with bins as well as the significant improvement in the quality of the fish could eventually justify the use of refrigeration in the holds of Quebec trawlers.

The four storage methods studied were bulk storage, refrigerated bulk storage, storage using containers and storage using refrigerated containers. Samples of cod were taken on four separate trips. The results showed there was no difference between fish stored in bulk or in containers when the holds are not refrigerated, but there was a difference when refrigerated holds were used, in which case better quality was obtained when the fish were kept in containers.

Ice consumption was lower when the hold was refrigerated. Storage in containers needs ice in a ratio of 1:2 (ice to fish) in an unrefrigerated insulated hold and 1:5 in a refrigerated hold. Ice consumption was some 2.4 times greater for storage in containers than for bulk storage.

Suction pump unloading system

Tub unloading system

Evaluating Three Unloading Systems

A study was conducted at Rivière au Renard in the Gaspé to determine if three common unloading systems—suction pumps, tubs and containers—result in different qualities of landed cod. The results show that the use of a container system least affects the quality of fish, while the suction pumps have the most effect on quality. The decline in quality was most obvious in fillets, more than 60 per cent of which suffered textural damage when the pump was used. Unloading led to an average 30 per cent increase in bruising, likely due to the fact that forks were used in the hold in all three systems.





In addition to minimizing physical damage, an unloading system should be chosen for its efficiency. An analysis of unloading operations showed that the pump is three times as fast as the tubs and four times as fast as the bin.

Preservation of Snow Crab in Seawater Ice

A comparative study showed there was no significant difference in the mortality of snow crab stored in bulk in either freshwater ice or seawater ice. In the first test, involving soft-shell crabs, the mortality rate in freshwater ice ranged from 42 per cent after 30 hours to 63 per cent after 48 hours. The corresponding mortality for storage in seawater ice was between 48 and 82 per cent.

A second test was conducted during regular commercial fishing operations. A total of 8,064 crabs were examined consisting of 3,631 held in freshwater ice and 4,443 held in seawater ice during 3 fishing trips.

On Board Storage of Lobster

In assessing the conventional storage of lobster in wooden boxes and preserving live lobster in a seawater tank equipped with a circulation system, scientists found the tanks have a definite potential for improving the quality of the product sold in the marketplace.

The mortality rate recorded in the sample (386 lobsters) in the tank was zero from capture to unloading. After several hours of storage in a pond, a mortality rate of less than 2 per cent was noted. By contrast, the mortality rates for lobster stored in wooden boxes were 5.5 per cent and 7.3 per cent 24 hours after unloading.

The strength and vitality of the lobster (movement of claws, for example) when removed from the tank were excellent, with no sign of weakening. In comparison, the lobster stored in wooden boxes showed little sign of life after unloading, and some were dead. Similar characteristics were observed 20 to 24 hours after unloading.



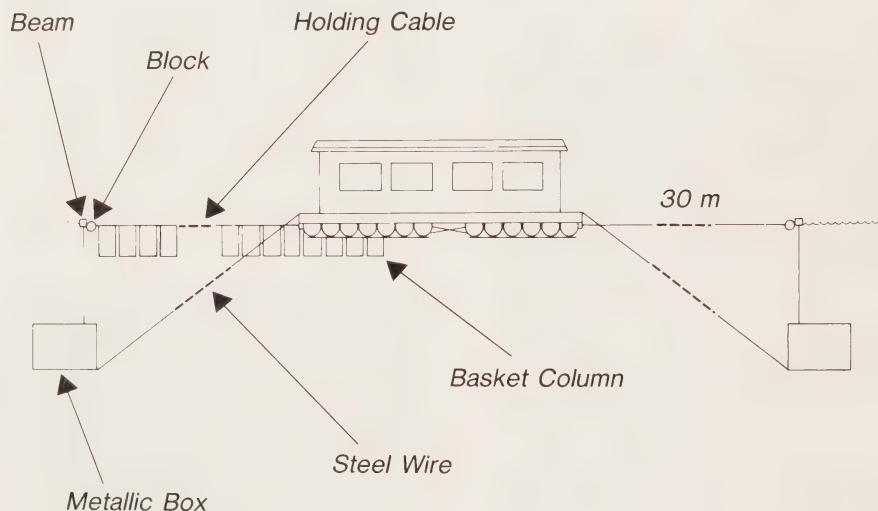
Container unloading system

Lobster holding tank with circulating seawater

Development of a Lobster Suspended Culture System

This experiment took advantage of the moulting period of lobsters held in capacity to achieve better weight gains while trying to control deaths by gaffkemia. During the experiment, the average individual weight gain was 38.6 per cent and the length gain 11.1 per cent. Of the 1,435 lobsters grown, 9.4 per cent were lost due to mortality, 4.2 per cent to faulty system preparation and 3.7 per cent to theft by residents.

Lobster Suspended Culture System



Furthering Squid Knowledge

Scientists sought to fill in some gaps in our knowledge of squid which migrate into the Gulf. The squid's presence in Canadian coastal waters is seasonal and depends on the temperature (7°C) and salinity (at least 27 per cent) of the environment. This species makes daily vertical migrations whose rhythm is observed even among larvae. The depth that it occupies seems to increase with age. Very little information is available on the horizontal migration.

The squid population found along the coasts of Canada in the spring is composed of juveniles migrating to shallower waters to feed and complete their growth. Their diet consists mainly of invertebrates and small fish. The seasonal and annual variations in the squid population and the gaps in knowledge of some aspects of the

development cycle make it difficult to determine whether the squid belong to a single stock from one annual generation.

Two exploratory cruises were conducted along the Gaspé coast aboard the "Marylène B" during July and August. The 15 meter (50') longliner, which was fitted with a jigger system, did not record any catches. Fishing was done at night with the aid of a spotlight.

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